that correspondingly consume large amounts of energy in the form of electricity or diesel fuel. There is also the problem of high noise generation levels with the use of large fans and motors.

OBJECT OF THE INVENTION

It is an object of the present invention to seek to ameliorate some of the disadvantages and limitations of the prior art dust removal systems or to at least provide the public with an alternative and useful choice.

SUMMARY OF THE INVENTION

Accordingly in one aspect, the invention resides in an improved wet dust removal apparatus including in combination

a housing having an inlet and an outlet, the housing adapted to contain

powered air induction means adapted to induce air contaminated with particulate matter into the inlet,

water spraying means adapted to spray a mist of water into the induced air stream to capture the particulate matter,

water removal means downstream of said water spraying means adapted to remove water droplets containing the particulate matter prior to the air exiting the housing via the outlet,

the water removal means positioned in the housing at an oblique angle or parallel to the direction of the air flow thereby increasing the surface area for removing the water droplets, wherein

the angled or parallel position and the increased surface area reduces the air pressure and velocity required to remove dust for a given volume of air, and wherein in use, the energy consumption of the air induction means is thereby also reduced.

In a second aspect, the invention resides in a wet and dry dust removal apparatus for drilling applications including in combination

a housing having an inlet and an outlet, the housing adapted to contain

powered air induction means adapted to induce air contaminated with large and small drilling particulate material from the vicinity of a drilling operation into the inlet via a suction passage connected to the inlet,

cyclonic vacuum means adapted to remove by vacuum, the large and small particulate material,

water spraying means adapted to spray a mist of water into air exiting from the vacuum means to capture any fine dust particles escaping the vacuum means,

water removal means downstream of said water spraying means adapted to remove water droplets containing the dust prior to the cleaned air exiting the housing via the outlet,

the water removal means positioned in the housing at an oblique angle or parallel to the direction of air flow thereby increasing the surface area for removing the water droplets wherein the angled or parallel position and increased surface area reduces the air pressure and velocity required to remove dust for a given volume of air and, wherein in use, the energy consumption of the cyclonic vacuum means is thereby also reduced.

Preferably, the housing comprises a rectangular or cylindrical vessel having the inlet and outlet at either end.

Preferably, the vessel is fabricated from sheet steel which is welded. In the alternative, the vessel can be of fiberglass or aluminum construction.

Preferably, there are directional vane members for directing the air flowing out through the outlet in a preferred direction.

Preferably, the powered air induction means comprises an electric or hydraulic drive mechanism powering a fan,

Preferably, the fan is a multi-bladed fan with a blade diameter of up to one metre.

Preferably, the water spraying means comprises a plurality of water spray nozzles adapted to spray water droplets in the order of 100 microns in size.

Preferably, the nozzles are connected to a manifold into which water is injected under pressure.

Preferably, the water removal means comprises a mist eliminator fabricated from stainless steel or plastic filaments of various diameters and compositions.

Preferably, the individual filaments are between 0.05 mm to 2.5 mm in diameter.

More preferably, the filaments are approximately between 0.25mm and 0.50mm in diameter.

Preferably, the angle at which the water removal means is positioned in relation to the air flow is to optimize water removal.

Preferably, the cyclonic vacuum means comprises a cyclone type vessel which removes particles larger than 1.00 mm in size by centrifugal action and wherein smaller particles which do not conform to the physical forces are captured by the water spraying means.

Preferably, the suction passage comprises a shroud surrounding the drill adapted to contain solid particles and dust, the shroud connected by a flexible corrugated hose to the inlet.

Preferably, the cyclonic vacuum means is electrically driven. Alternatively, the cyclonic vacuum means can be driven by an internal combustion engine, typically a small diesel engine.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the present invention be more readily understood and put into practical effect, reference will now be made to the accompanying illustrations wherein:

Figure 1a and 1b are preferred embodiments of the invention according to Example 1,

Figure 1c is another embodiment of the invention of Example 1,

Figure 1d is a further embodiment of the invention of Example 1,

Figure 2 shows an existing dust scrubber typical of the prior art, and

Figure 3 shows a preferred embodiment of the second aspect of the invention according to Example 2,

DETAILED DESCRIPTION OF THE DRAWINGS

Example 1

Figures 1a and 1b show preferred embodiments of the invention according to Example 1. The wet dust removal apparatus 200, shown in front and side views, 201 respectively comprises a rectangular housing of stainless steel. The housing has an inlet 204 and an outlet 206 wherein the outlet preferably has directional vane

members 208-210 to direct the outflow of clean air in a preferred direction. The inlet houses a multi bladed fan 212 and comprises the air induction means which is powered preferably by an electrical hydraulic motor. The use of hydraulic motors is preferred in mining applications, as there is a danger of arcing or sparking with electric motors. Air containing dust particles are induced by the fan to flow into the housing via the inlet. Water mist is then sprayed into the air stream by a plurality of nozzles 218, 219, 220 comprising the water spraying means. Droplets of water capturing the dust particles are removed by the mist eliminator 222, 223. The mist eliminator comprises the water removal means and is preferably a filamentous composition of stainless steel and plastic filaments contain the frame or box between two panels of stainless steel mesh. The stainless steel plastic filaments 224 are preferably between 0.5mm to 2.5mm in diameter but more preferably have a diameter of between 0.25mm and 0.5mm. As is shown the mist eliminator 222 is circular in configuration in Figure 1a and semi-circular 223 in Figure 1b and is disposed parallel to the air flow to increase the surface area for water droplet removal and also to reduce the velocity in air pressure required to remove the same amount of water droplets when compared to a prior art mist eliminator positioned substantially perpendicularly to the air flow this results in less fan speed required and the need for energy expended in terms of large electrical or hydraulic motors. This contributes in a significant reduction to the energy consumption of the motor and a small fan can also be used.

Referring to Figure 1c there is shown another embodiment of the invention according to Example 1. The wet dust removal apparatus 10 preferably comprises a cylindrical or rectangular housing 12 or vessel fabricated of welded stainless sheet steel. In the alternative, the housing can be constructed of fibreglass or aluminum.

The housing has an inlet 14 and an outlet 16 wherein the outlet preferably has directional vane members 18, 20, 22 to direct the outflow of clean air in a preferred direction. The inlet houses a fan 24 comprising the air induction means which is powered preferably by an electric or hydraulic motor. The use of hydraulic motors is preferred in mining applications as there is a danger of arcing or sparking with electric motors. Air containing dust particles are induced by the fan to flow into the housing via the inlet. Water mist 26, 28, 30 is then sprayed into the air stream by a plurality of nozzles 32, 34, 36 comprising the water spraying means. Droplets of water capturing the dust particles are removed by the mist eliminator 40. The mist eliminator that comprises the water removal means, is preferably a filamentous composition of stainless steel or plastic filaments 42 contained in a frame or box or between two panels 43, 45 of stainless steel mesh. The stainless steel or plastic filaments are preferably between 0.05 mm to 2.5 mm in diameter but more preferably have a diameter of between 0.25mm and 0.50mm. As is shown, the mist eliminator is disposed at an angle to the air flow to increase its surface area for water droplet removal. The increased surface area reduces the velocity and air pressure required to remove the same amount of water droplets as for a mist eliminator positioned substantially perpendicularly or at 90° to the air flow. This results in less fan speed required and the need for large electrical or hydraulic motors. This contributes in a reduction to the energy consumption of the motor and a smaller fan can also be used.

Figure 1d shows another embodiment of the invention of Example 1. In this version, there are a pair of mist eliminators 50, 52 of the same design as that described for Figure 1. The mist eliminators are positioned in an A-frame configuration in the housing 54 as shown in the sectional transverse view A-A. Air

CLAIMS

1. A wet dust removal apparatus including in combination

a housing having an inlet and an outlet, the housing adapted to contain

powered air induction means adapted to induce air contaminated with particulate matter into the inlet,

water spraying means adapted to spray a mist of water into the induced air stream to capture the particulate matter,

water removal means downstream of said water spraying means adapted to remove water droplets containing the particulate matter prior to the air exiting the housing via the outlet,

the water removal means positioned in the housing at an oblique angle to the direction of the air flow thereby increasing the surface area for removing the water droplets, wherein

the angled position and the increased surface area reduces the air pressure and velocity required to remove dust for a given volume of air, and wherein in use, the energy consumption of the air induction means is thereby also reduced.

2. A wet dust removal apparatus including in combination

a housing having an inlet and an outlet, the housing adapted to contain

powered air induction means adapted to induce air contaminated with particulate matter into the inlet,

water spraying means adapted to spray a mist of water into the induced air stream to capture the particulate matter,

water removal means downstream of said water spraying means adapted to remove water droplets containing the particulate matter prior to the air exiting the housing via the outlet,

the water removal means positioned in the housing parallel to the direction of the air flow thereby increasing the surface area for removing the water droplets, wherein

the paralleled position and the increased surface area reduces the air pressure and velocity required to remove dust for a given volume of air, and wherein in use, the energy consumption of the air induction means is thereby also reduced.

3. A wet and dry dust removal apparatus for drilling applications including in combination

a housing having an inlet and an outlet, the housing adapted to contain

powered air induction means adapted to induce air contaminated with large and small drilling particulate material from the vicinity of a drilling operation into the inlet via a suction passage connected to the inlet,

cyclonic vacuum means adapted to remove by vacuum, the large and small particulate material,

water spraying means adapted to spray a mist of water into air exiting from the vacuum means to capture any fine dust particles escaping the vacuum means,

water removal means downstream of said water spraying means adapted to remove water droplets containing the dust prior to the cleaned air exiting the housing via the outlet,

the removal means positioned in the housing at an oblique angle to the direction of air flow thereby increasing the surface area for removing the water droplets wherein the angled position and increased surface area reduces the air pressure and velocity required to remove dust for a given volume of air and, wherein in use, the energy consumption of the cyclonic vacuum means is thereby also reduced.

4. A wet and dry dust removal apparatus for drilling applications including in combination

a housing having an inlet and an outlet, the housing adapted to contain

powered air induction means adapted to induce air contaminated with large and small drilling particulate material from the vicinity of a drilling operation into the inlet via a suction passage connected to the inlet,

cyclonic vacuum means adapted to remove by vacuum, the large and small particulate material,

water spraying means adapted to spray a mist of water into air exiting from the vacuum means to capture any fine dust particles escaping the vacuum means,

water removal means downstream of said water spraying means adapted to remove water droplets containing the dust prior to the cleaned air exiting the housing via the outlet,

the removal means positioned in the housing parallel to the direction of air flow thereby increasing the surface area for removing the water droplets wherein the parallel position and increased surface area reduces the air pressure and velocity required to remove dust for a given volume of air and,

wherein in use, the energy consumption of the cyclonic vacuum means is thereby also reduced.

5. A wet dust removal apparatus as claimed in claim 1 or claim 2 wherein, the housing comprises a rectangular or cylindrical vessel having the inlet and outlet at either end.

6. A wet dust removal apparatus as claimed in claim 1 or claim 2 wherein, the vessel is fabricated from sheet steel which is welded or is of fiberglass or aluminum construction.

7. A wet dust removal apparatus as claimed in claim 1 or claim 2 wherein there are directional vane members for directing the air flowing out through the outlet in a preferred direction.

8. A wet dust removal apparatus as claimed in claim 1 or claim 2 wherein the powered air induction means comprises an electric or hydraulic drive mechanism powering a fan,

9. A wet dust removal apparatus as claimed in claim 8 wherein, the fan is a multi-bladed fan.

10. A wet dust removal apparatus as claimed in claim 1 or claim 2 wherein the water spraying means comprises a plurality of water spray nozzles adapted to spray water droplets in the order of 100 microns in size.

11. A wet dust removal apparatus as claimed in claim 10 wherein the nozzles are connected to a manifold into which water is injected under pressure.

12. A wet dust removal apparatus as claimed in claim 1 or claim 2 wherein the water removal means comprises a mist eliminator fabricated from stainless steel or plastic filaments of various diameters and compositions.

13. A wet dust removal apparatus as claimed in claim 12 wherein the individual filaments are between 0.05 mm to 2.5 mm in diameter.

14. A wet dust removal apparatus as claimed in claim 12 wherein the filaments are between 0.25mm and 0.50mm in diameter.

15. A wet dust removal apparatus as claimed in claim 1 or claim 2 wherein the angle at which the water removal means is positioned in relation to the air flow is to optimize water removal.

16. A wet and dry dust removal apparatus as claimed in claim 3 or claim 4 wherein the cyclonic vacuum means comprises a cyclone type vessel which removes particles larger than 1.00 mm in size by centrifugal action and wherein smaller particles which do not conform to the physical forces are captured by the water spraying means.

17 A wet and dry dust removal apparatus as claimed in claim 3 or claim 4 wherein the suction passage comprises a shroud surrounding the drill adapted to contain solid particles and dust, the shroud connected by a flexible corrugated hose to the inlet.

18. A wet and dry dust removal apparatus as claimed in claim 3 or claim 4 wherein the cyclonic vacuum means is electrically driven or is driven by an internal combustion engine, typically a small diesel engine.

19. A wet dust removal apparatus as herein described with reference to Figures 1a, 1b, 1c, and 1d.

20. A wet and dry dust removal apparatus as herein described with reference to Figure 3.

PCT REQUEST

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VIII-3-1	**Declaration: Entitlement to claim priority** Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii)): Name:	in relation to this international application JOHNSON, Leslie, Vincent, Peddle is entitled to claim priority of earlier application No. 2002951368 by virtue of the following:
VIII-3-1 (i)		the applicant is the inventor of the subject matter for which protection was sought by way of the earlier application
VIII-3-1 (ix)	This declaration is made for the purposes of:	all designations